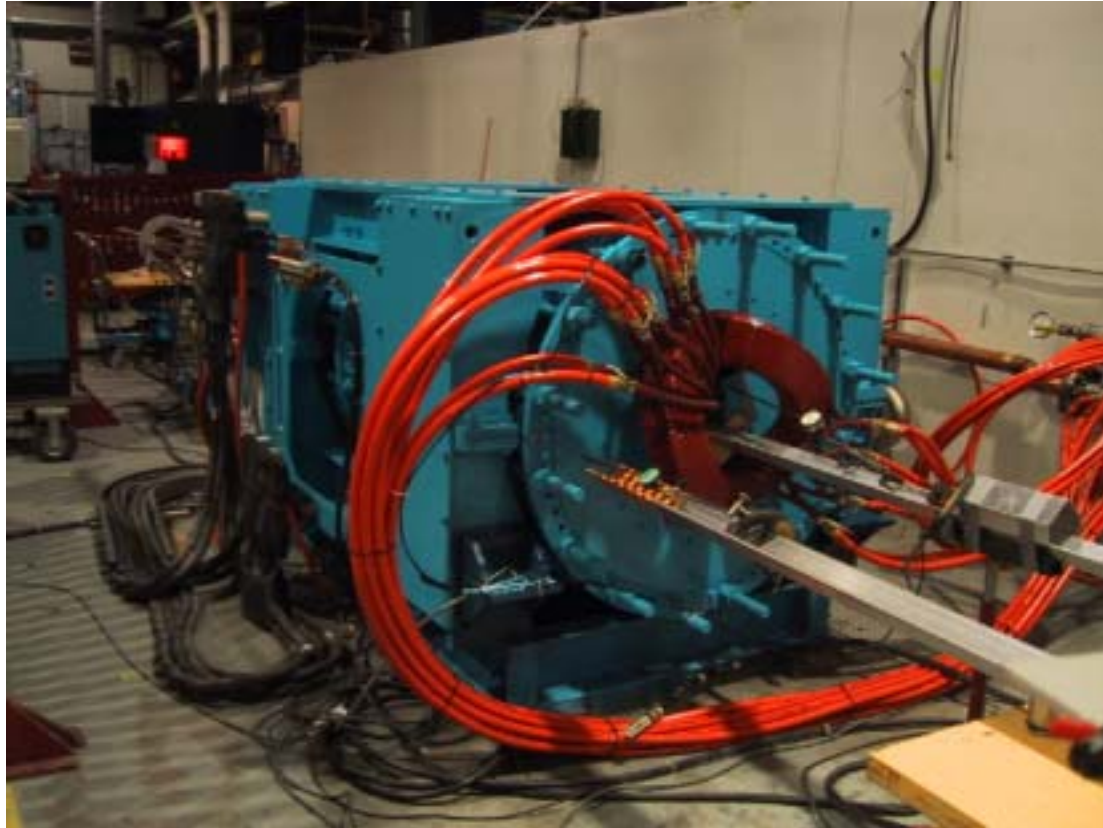


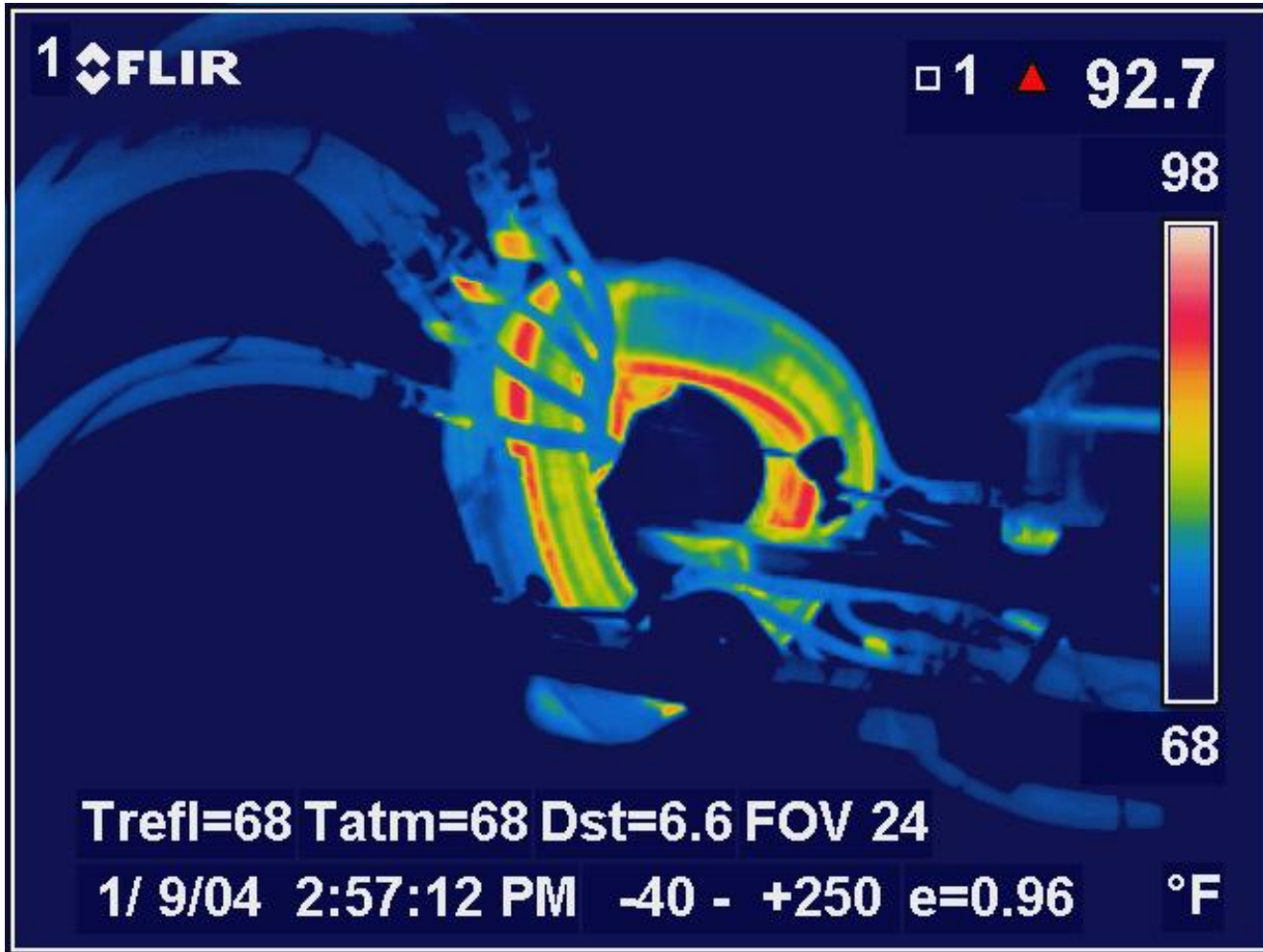
# AGS warm snake status and field mapping

Junpei Takano



The warm snake is under measurement in bldg.902.

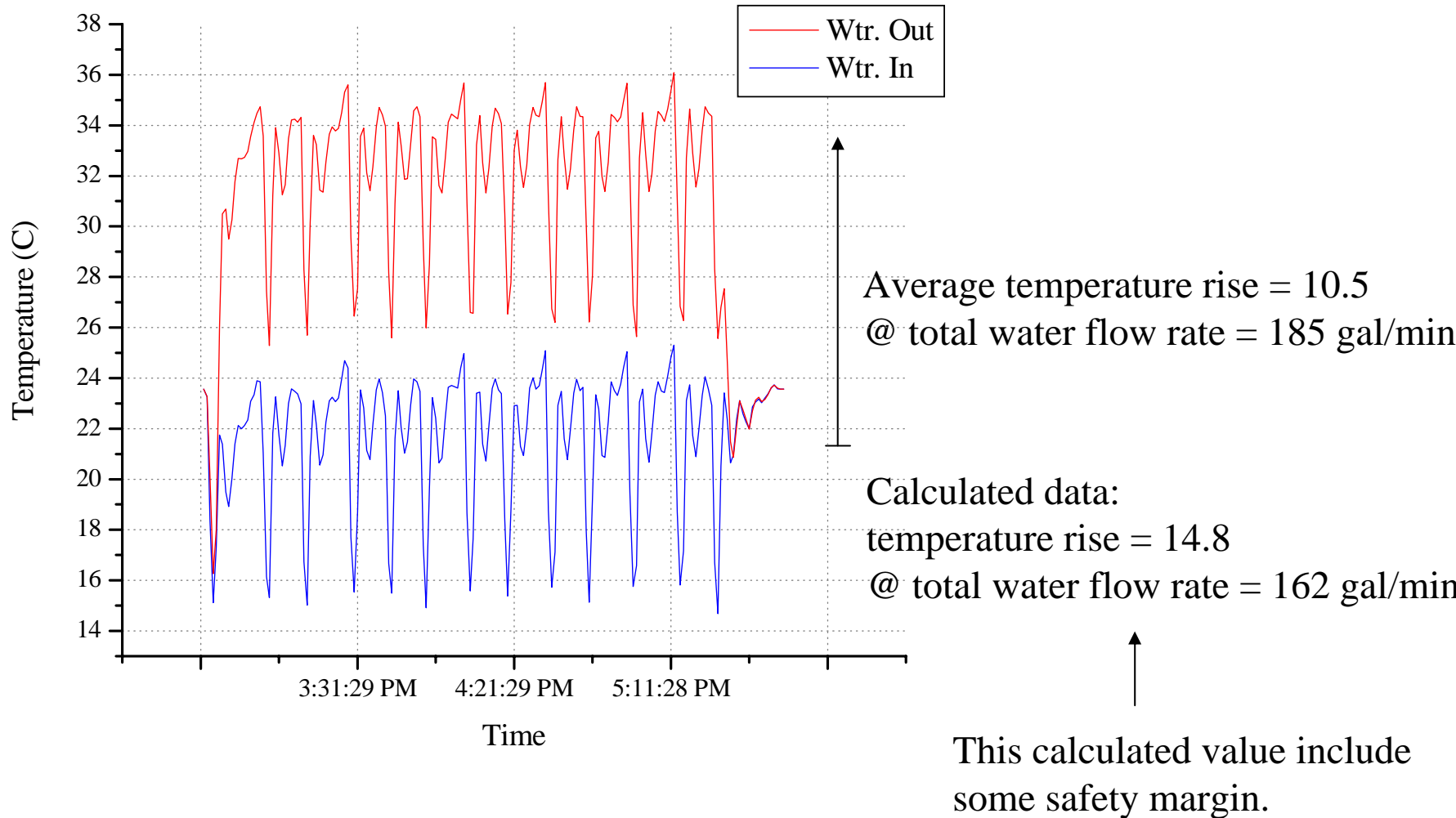
# Temperature rise



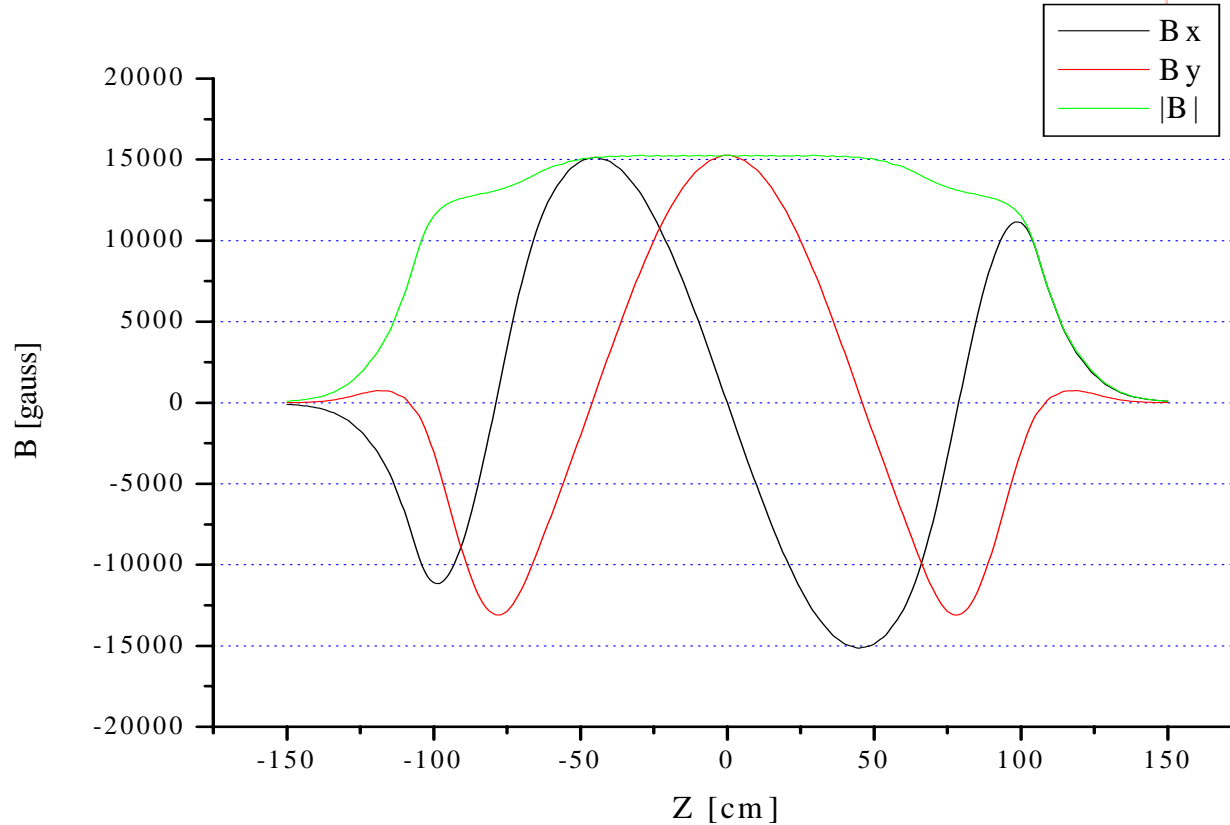
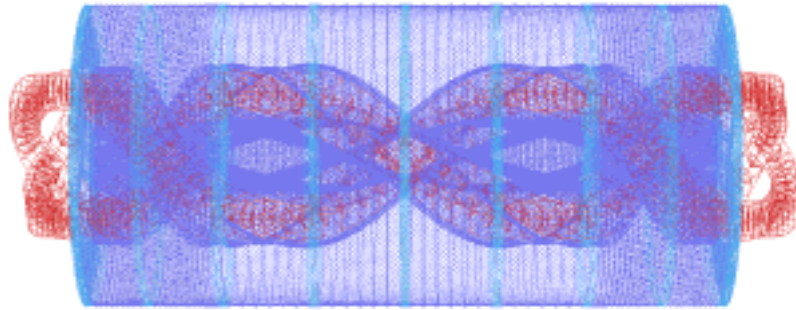
Thermo graphic data @ 2700Amp.

It is no problem within this temperature.

# Temperature rise



# Magnetic field on the z-axis

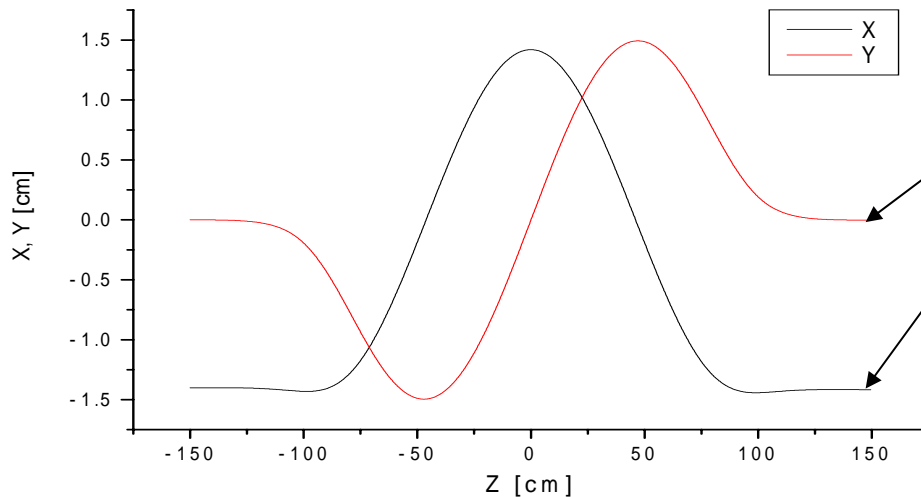
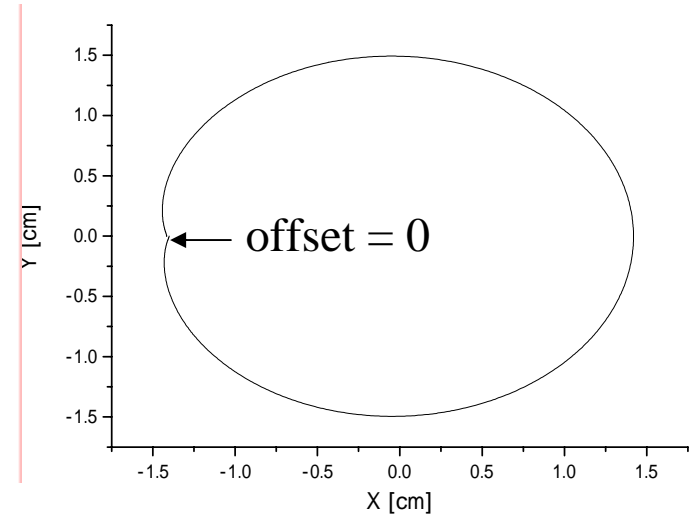
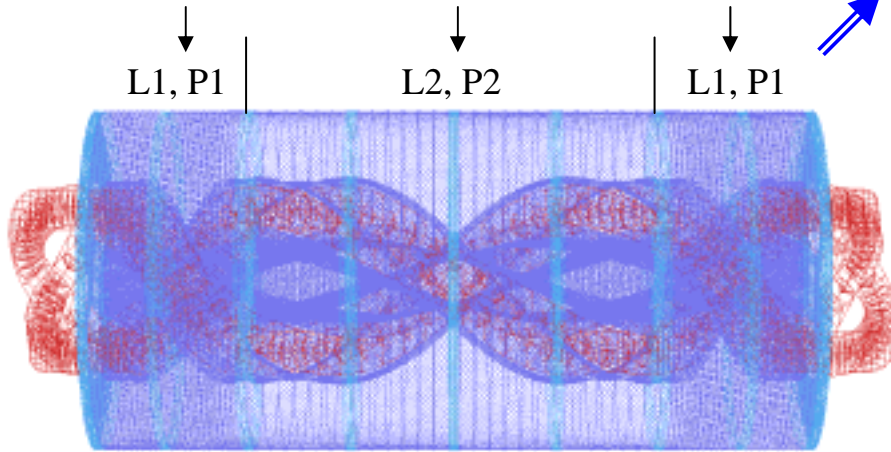


This graph is the simulated data by using OPERA\_3D.

# Simulated beam trajectory

$L1 = 39$  [cm],  $L2 = 132$  [cm]  
 $P1 = 90$  [cm/rev],  $P2 = 184$  [cm/rev]

these parameters were optimized



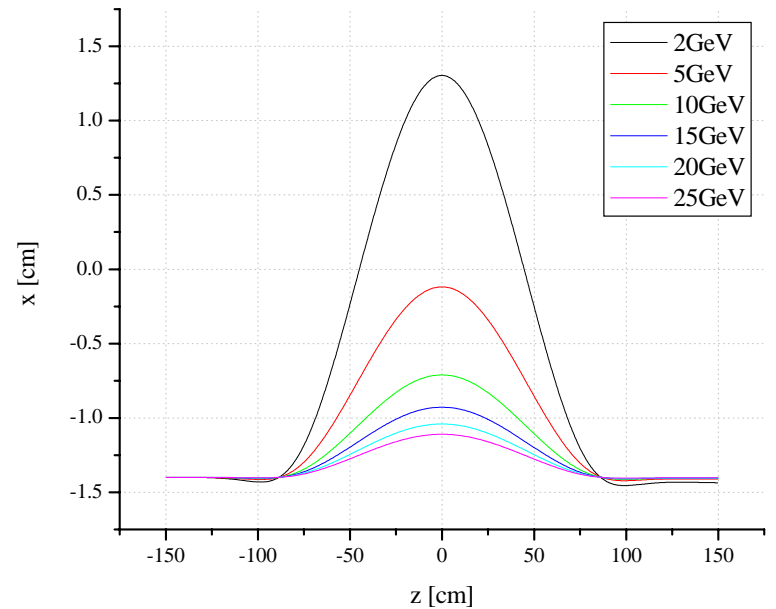
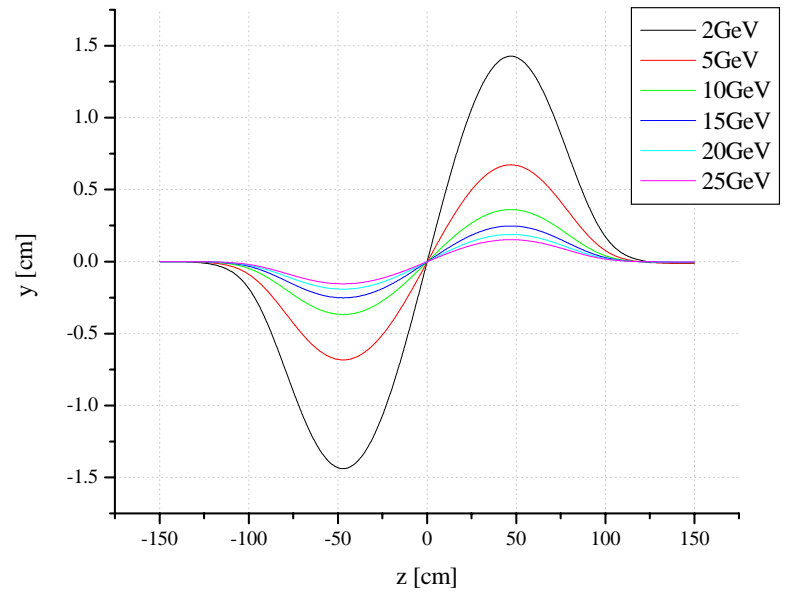
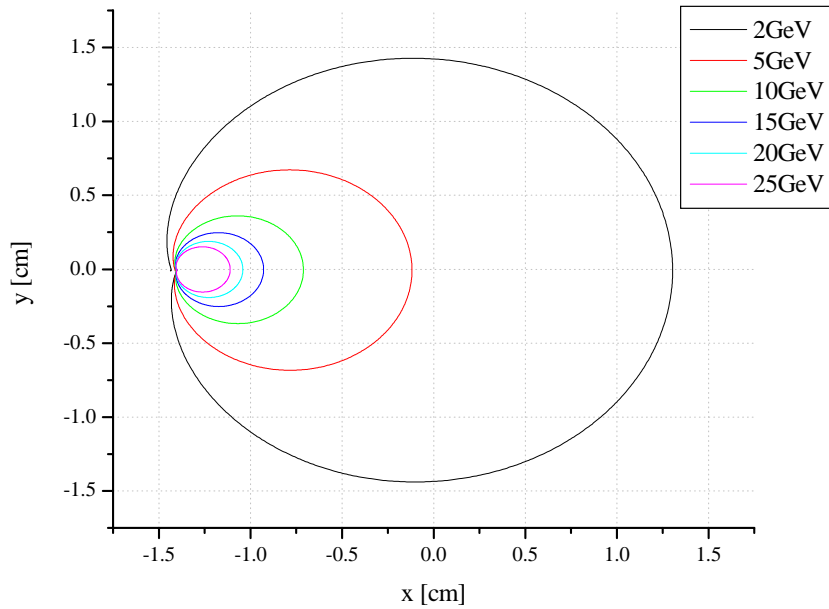
offset = 0

deflection angle = 0

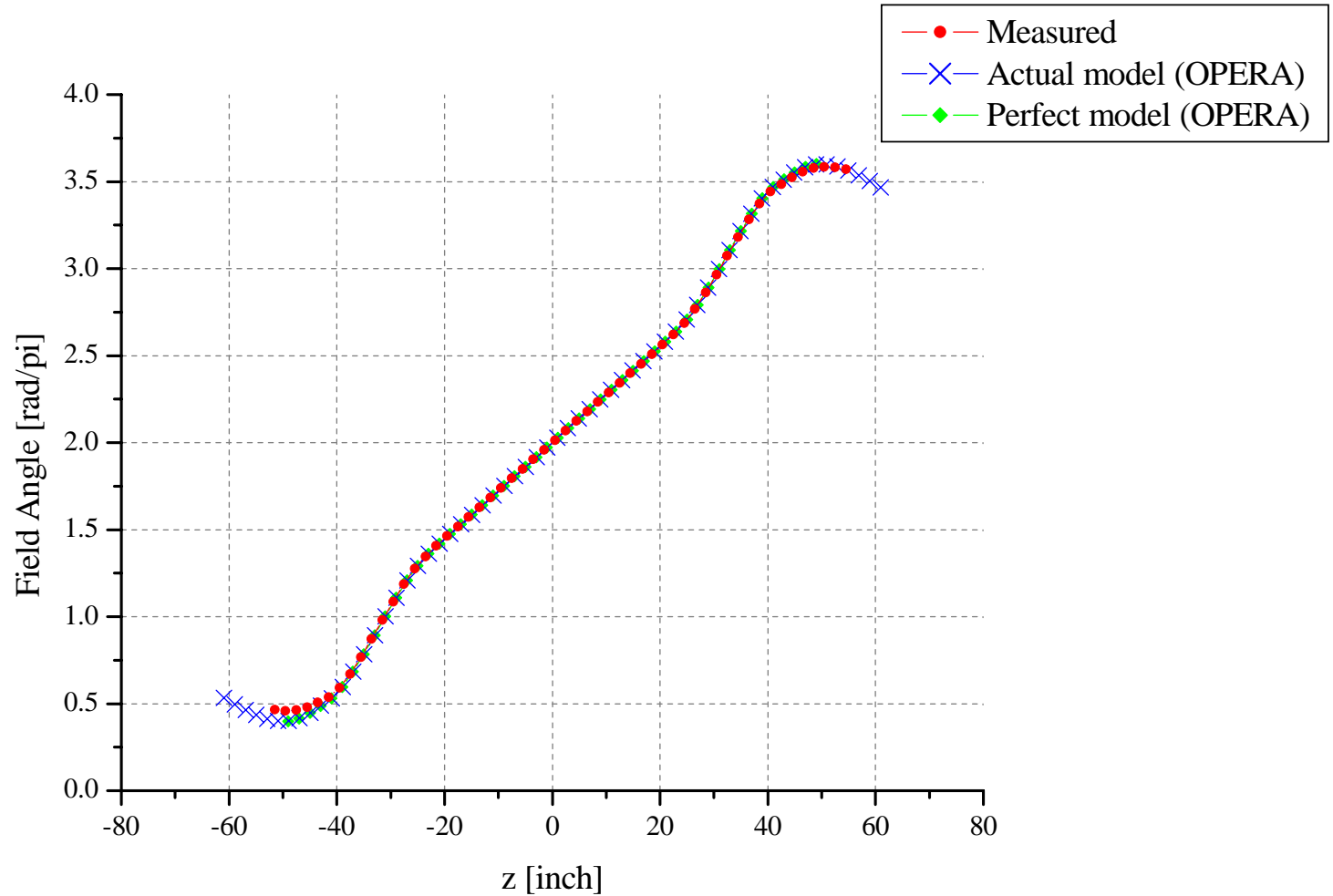
**This beam trajectory is perfect !**

# Beam trajectory

~ depending on the energy ~



# Measured magnetic field



This graph shows the Field Angle.  
It is almost fine.

# Error study

However these beam trajectories are the result of the ideal simulated model.  
The actual magnet has some errors.

The main errors which should be considered are:

- B-H curve of the steel

- Packing factor of the laminations

- Dimensional errors because of the lamination pressing

- Deformation of the yoke

- Coil position error

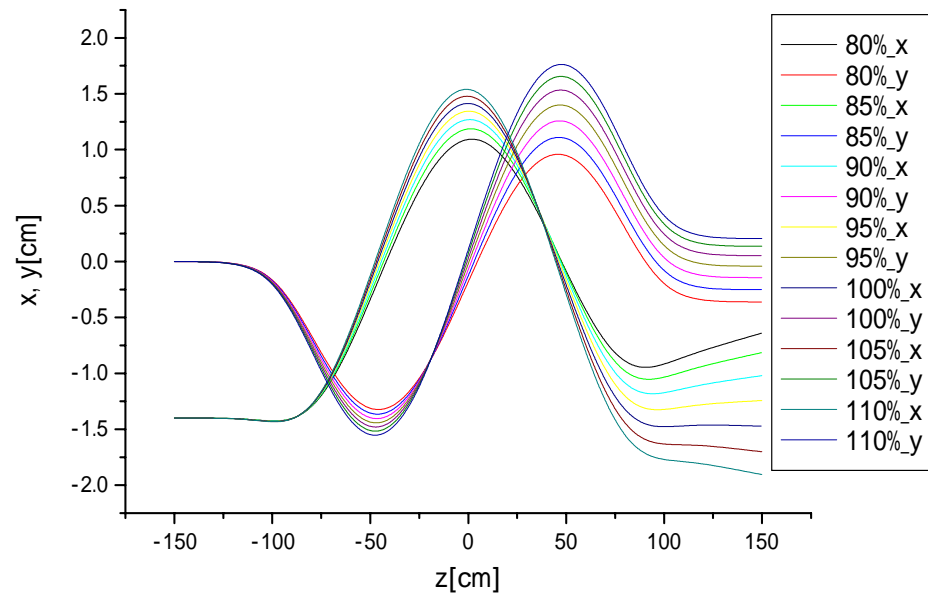
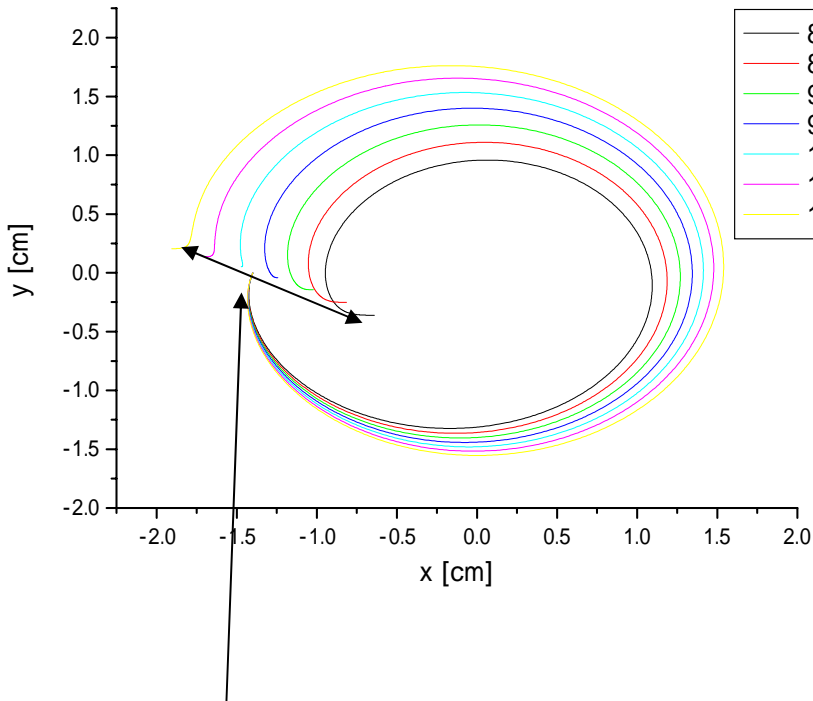
The model which is completely like the actual magnet must be simulated.



# Beam trajectory

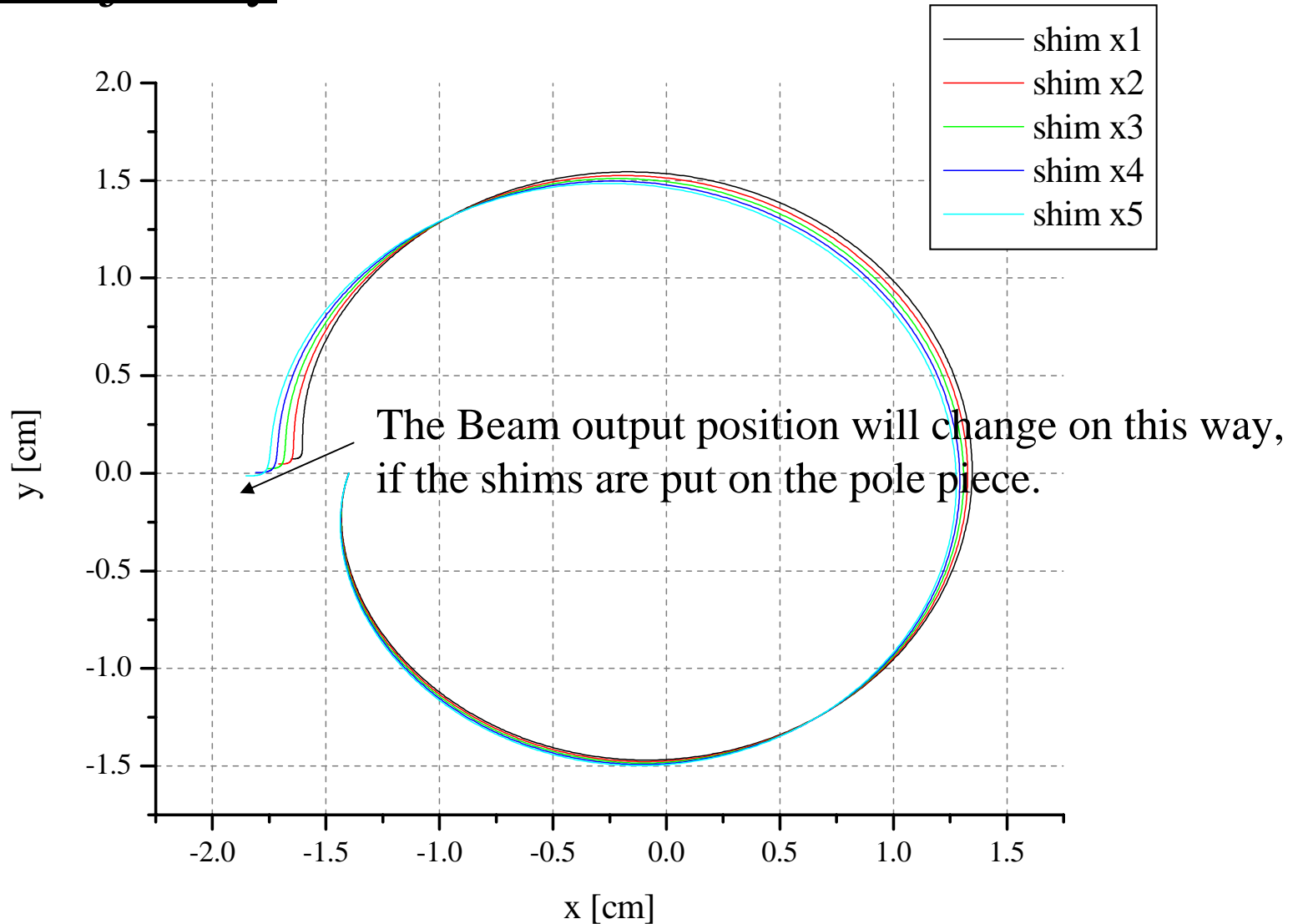
~ depending on the current ~

Current = 80% to 110%

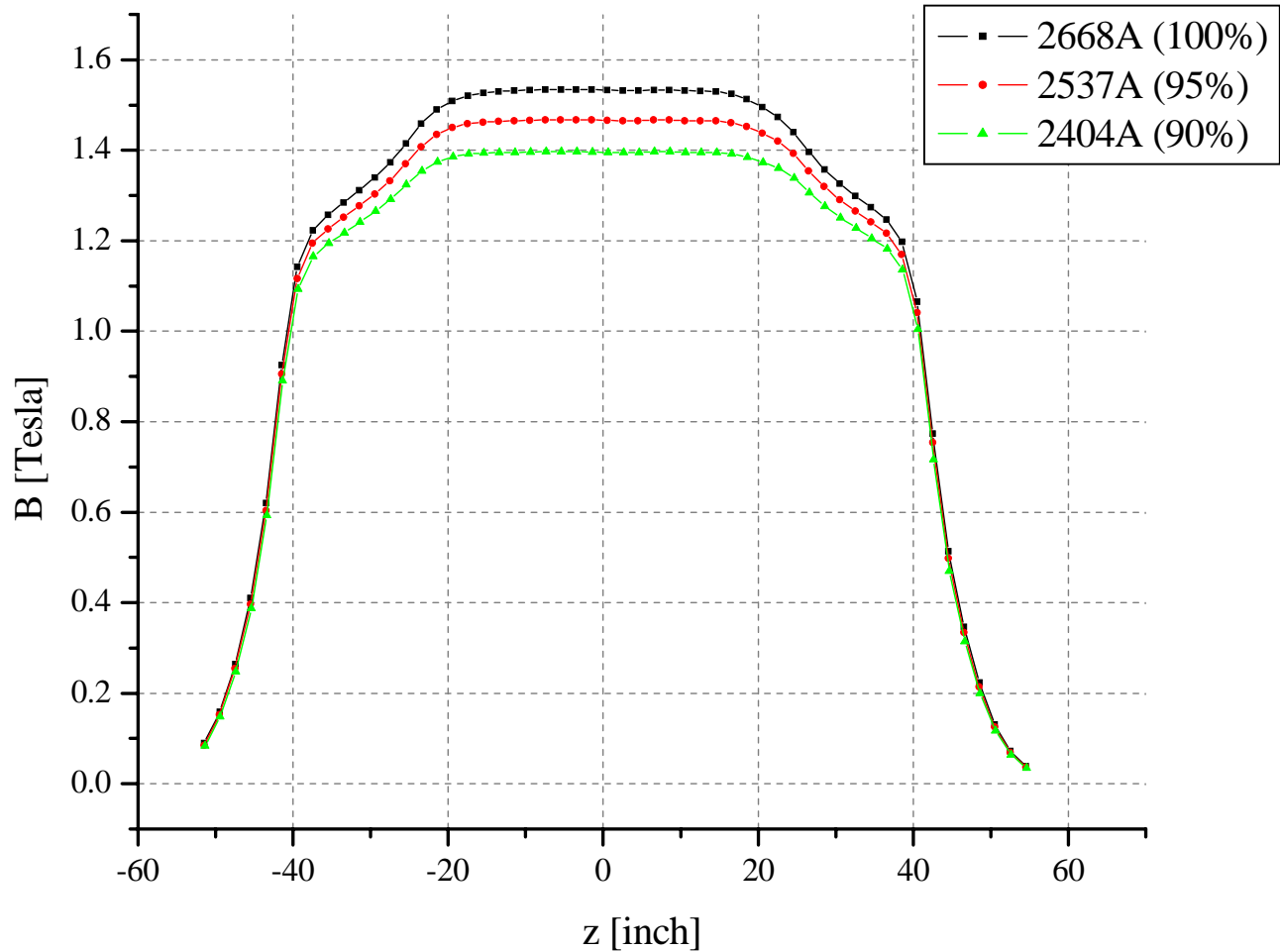


The operation current is one of the method for correcting the beam trajectory.

# Beam trajectory



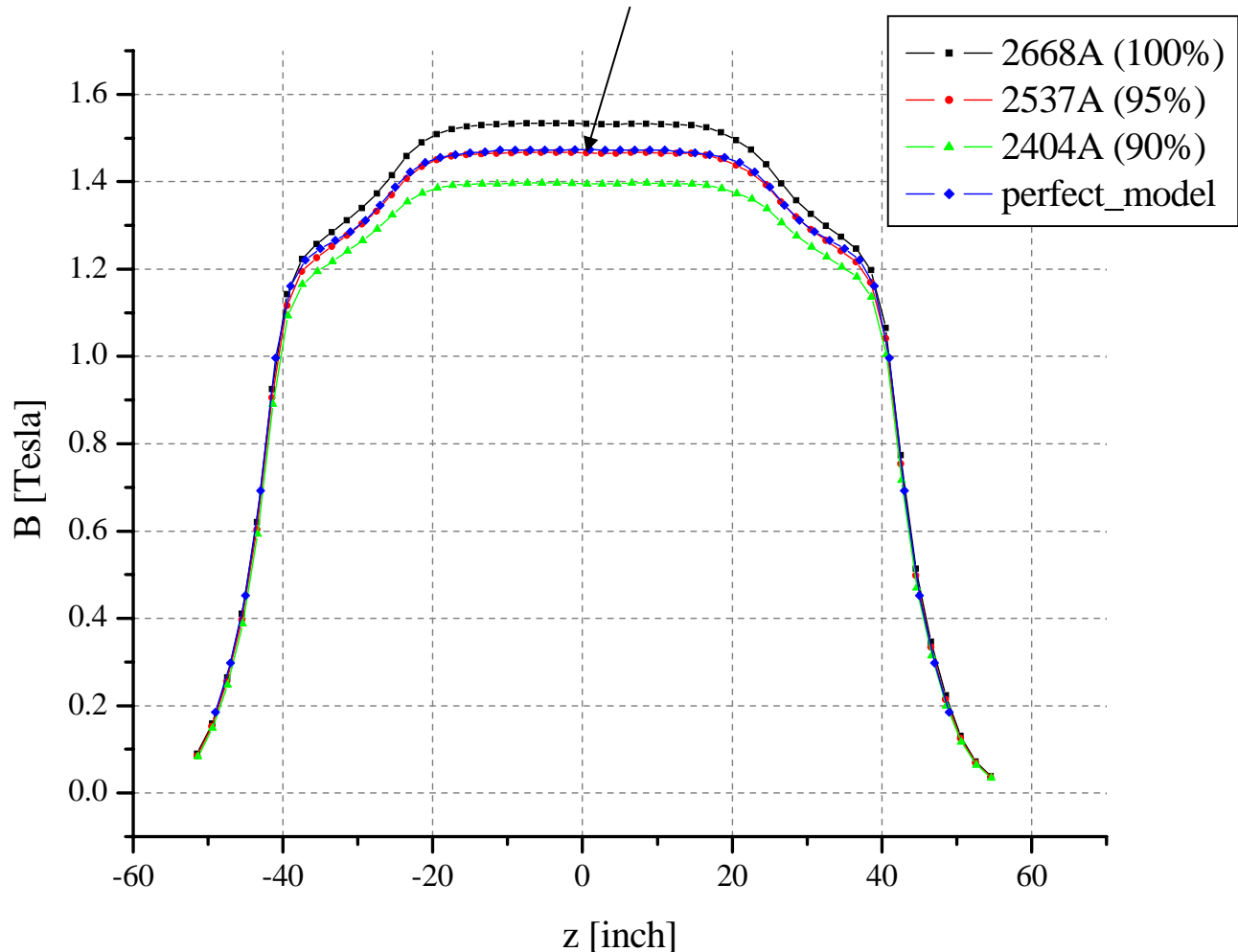
# Measured magnetic field



These plots are the measured data without shims.

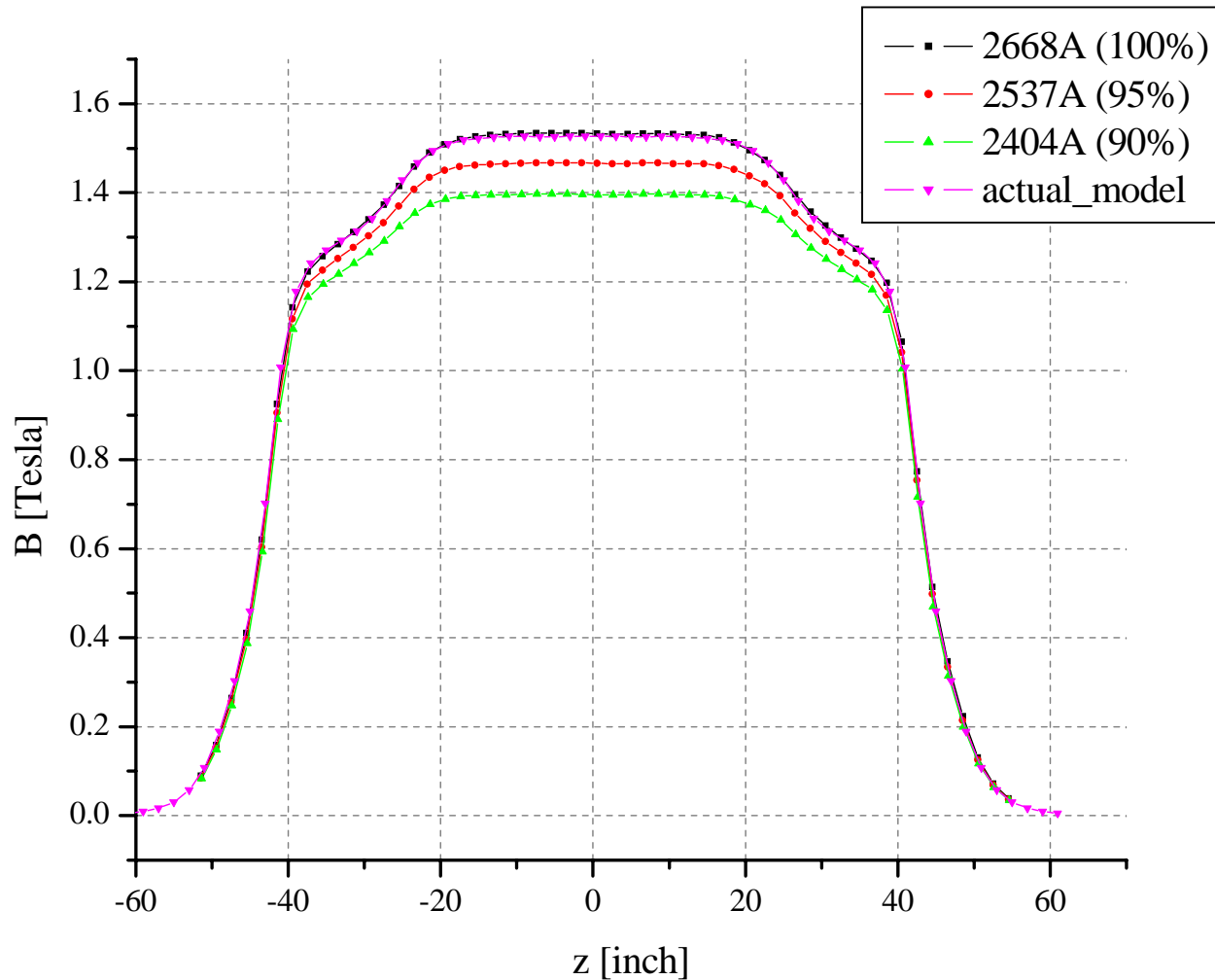
# Measured magnetic field

The harmonic coil data shows 97% of the actual magnetic flux because of probe length  
In actually the magnetic flux is 1.52T.



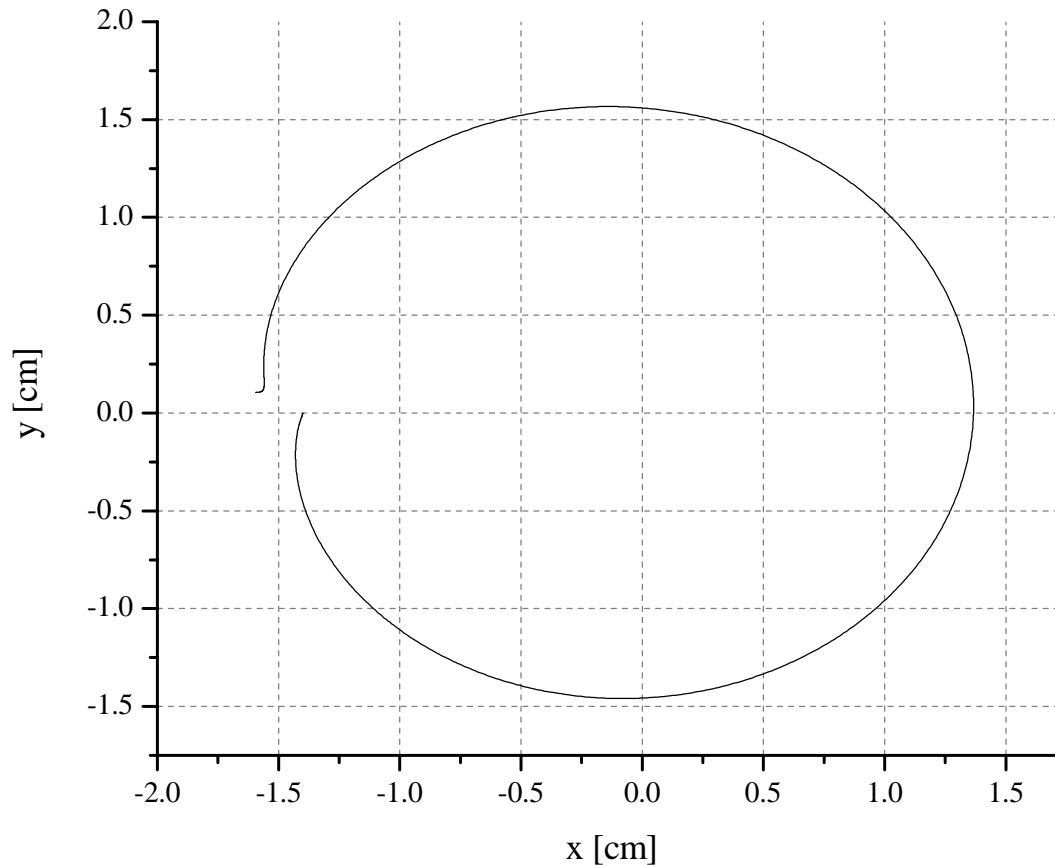
The plot of the perfect model is calculated data by using OPERA\_3D  
The simulated data was analyzed by using virtual harmonic coil on OPERA.

# Measured magnetic field



The actual model plot is the simulated data which model include some errors.

# Beam trajectory



This is the beam trajectory of the **actual model**.  
The output beam has offset and deflection angle.  
This beam trajectory was optimized by using matrix.

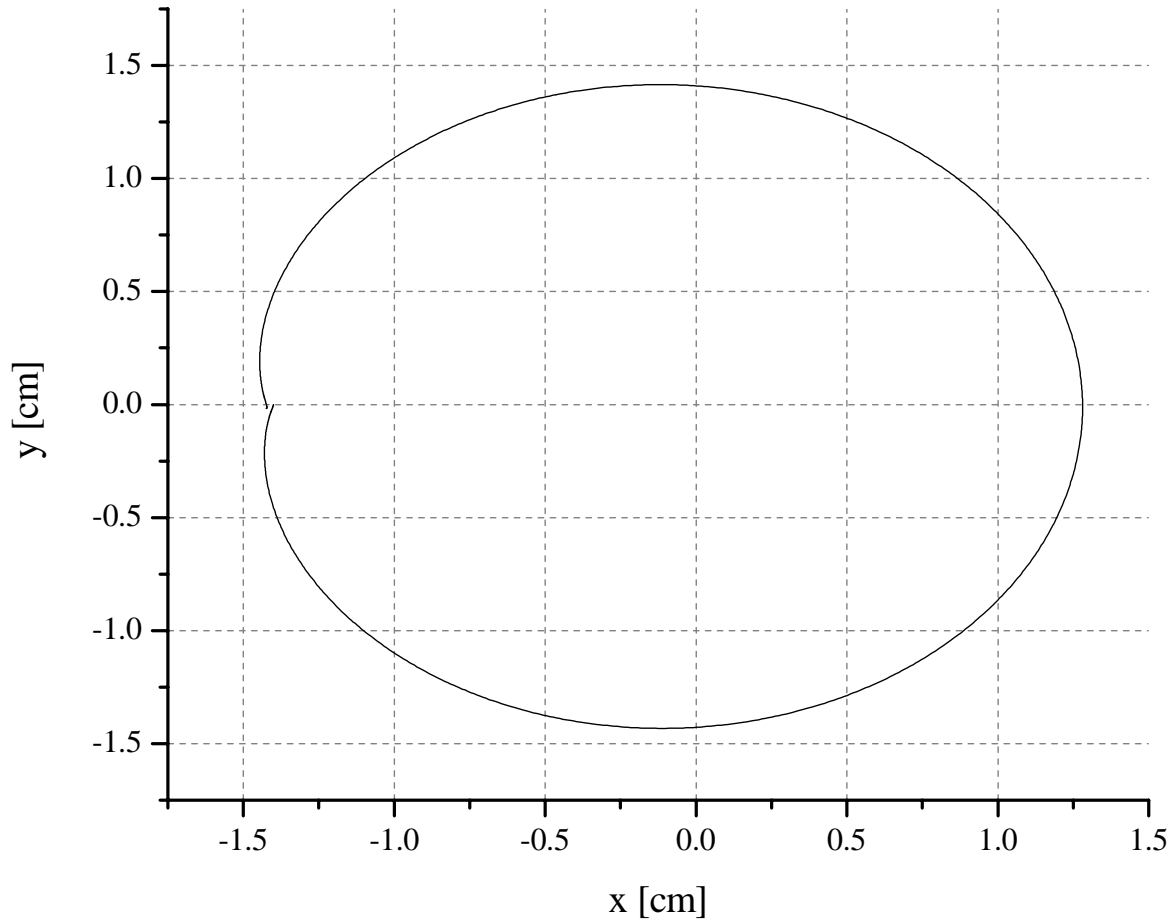
# Beam trajectory

The result of the matrix about the current and shims are:

current = 94.5%

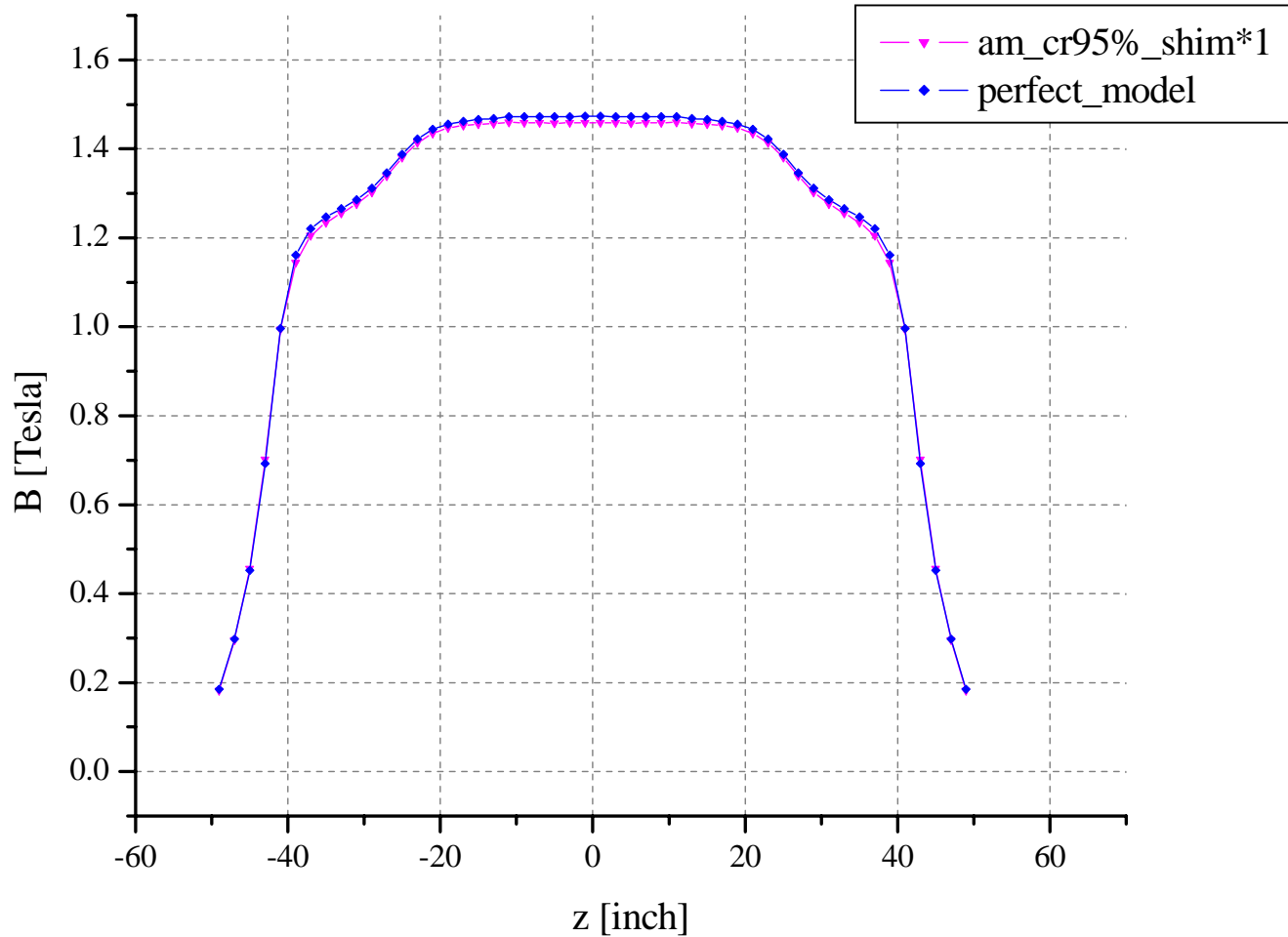
shims = 0.7

This trajectory is the output with 95% current and a shim.



Magnetic flux at the center of the magnet is 1.46 Tesla.

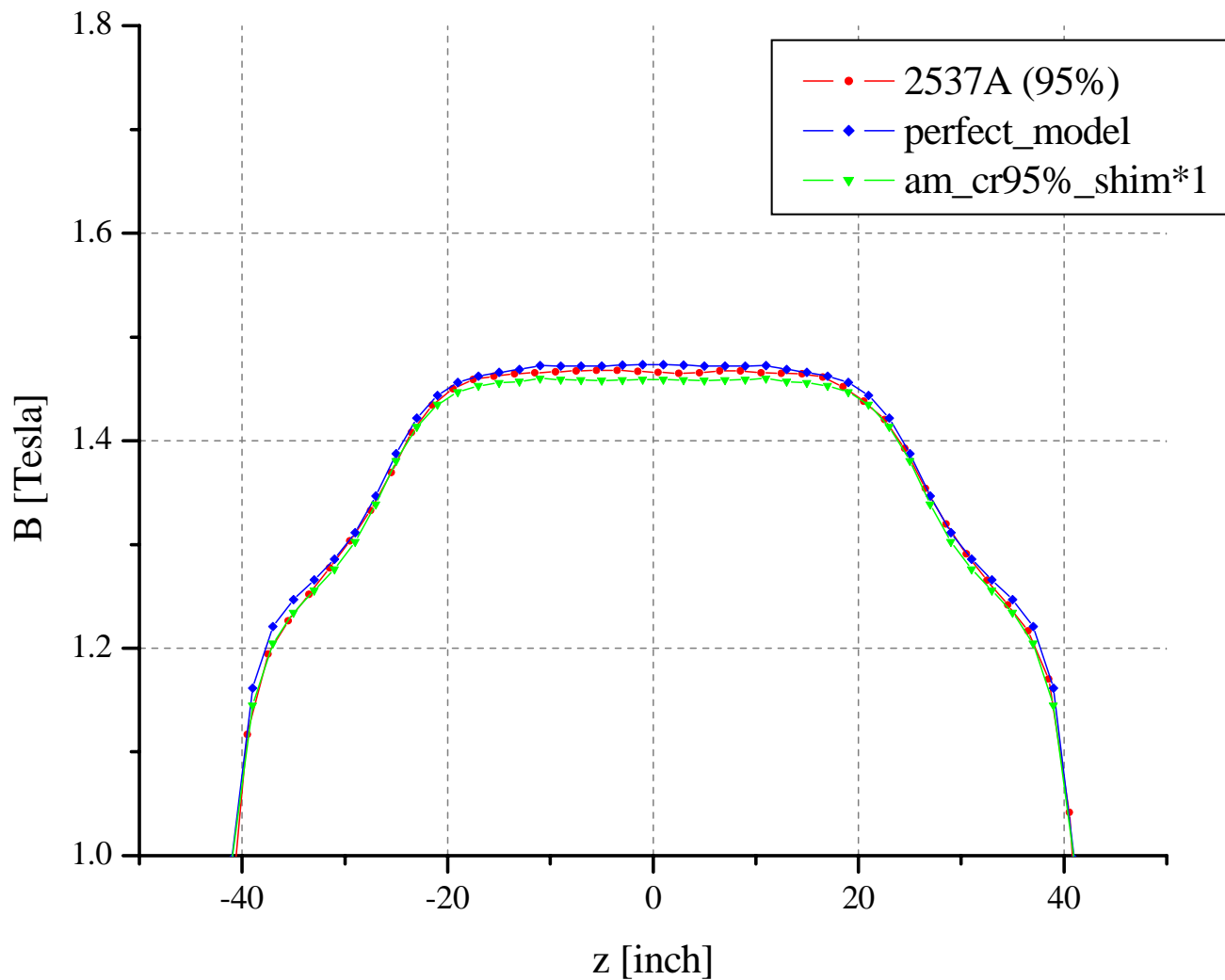
# Measured magnetic field



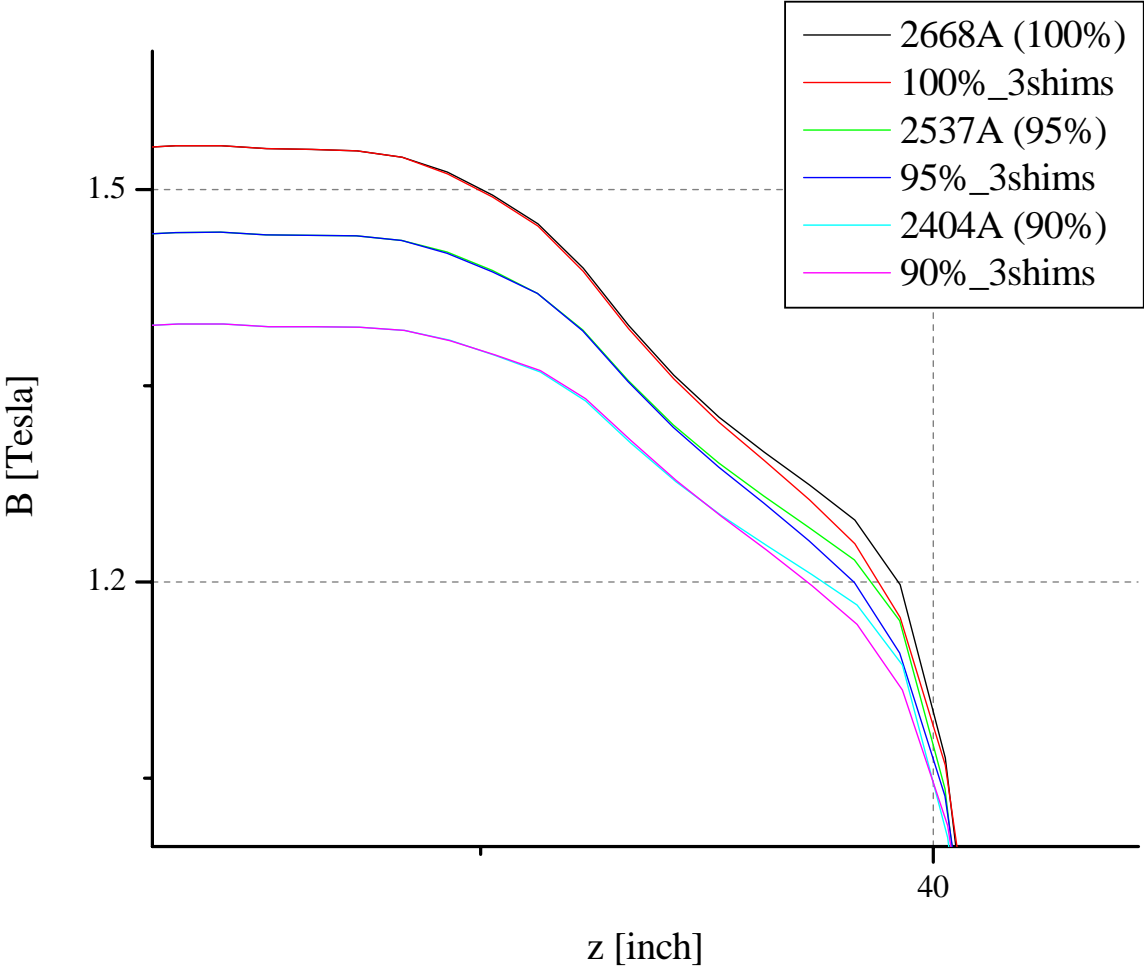
The optimized simulation data is similar to the plot of the perfect model.  
Next slide shows zoom up of this plots.



# Measured magnetic field

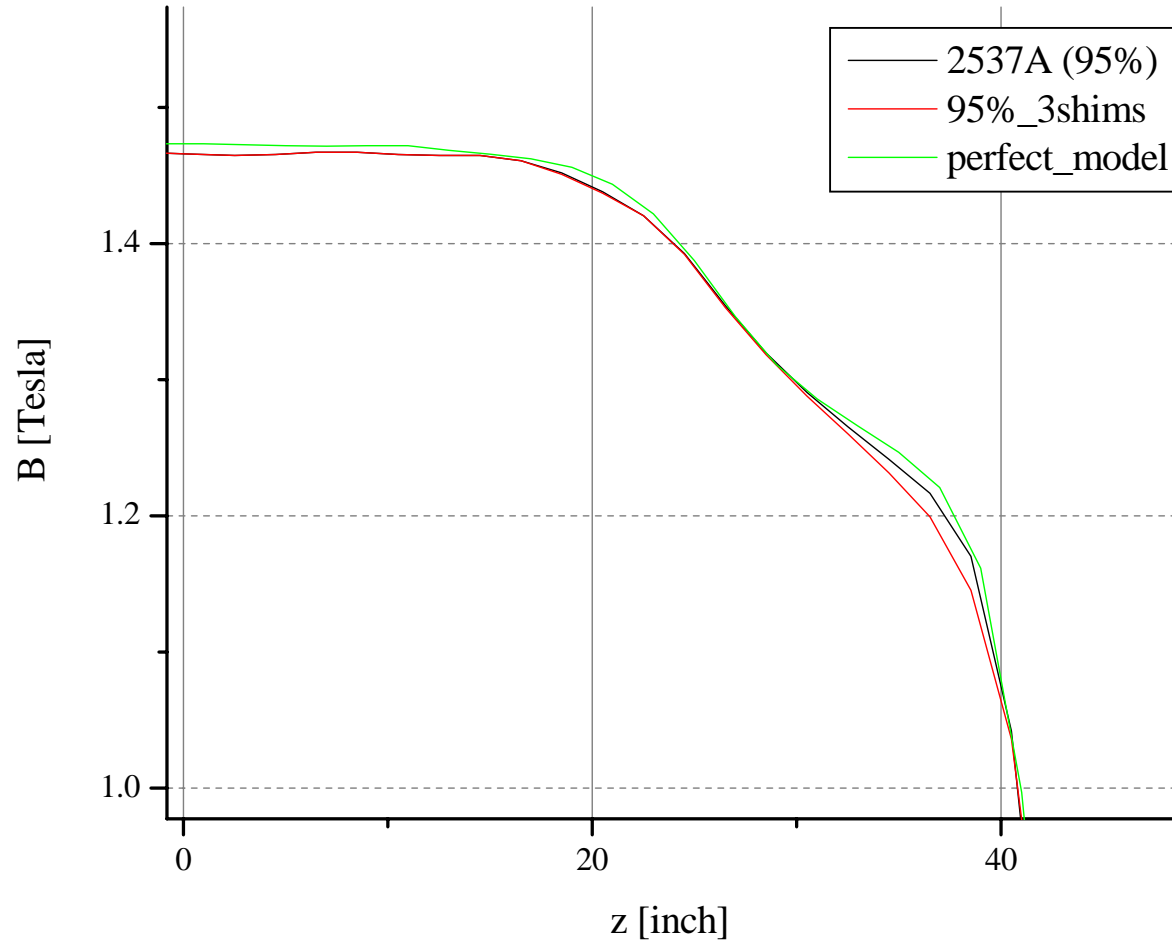


# Measured magnetic field



Measurement data with 3 shims

# Measured magnetic field



Comparing to the perfect model.  
The warm snake is under correctable.

# Summary

The magnetic flux is more powerful than simulation model at full current.  
But the beam trajectory is under control with current and shims.  
Currently the magnet is measured by using integral coil probe.  
I heard the integral data is good.  
The data will be coming up soon.  
And I am analyzing the measured magnetic field.  
These slides are the latest up date data.  
I'll send the newest analyzed data to you.

Thank you so much for taking care for me.

29.Jan.2004    Jun